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10/038,681	01/08/2002	Satoshi Tanaka	914-149	9040

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EXAMINER

DIAMOND, ALAN D

ART UNIT

PAPER NUMBER

1753

DATE MAILED: 09/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/038,681

Applicant(s)

TANAKA, SATOSHI

Examiner

Alan Diamond

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 January 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: reference sign S6 in Figure 2. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Specification***

2. The disclosure is objected to because of the following informalities: On page 7, at line 21, and on page 9, at lines 3 and 20, the term "spattering" should be changed to "sputtering". On page 9, at line 22, the word "when" should be changed to "When". Appropriate correction is required.

### ***Claim Objections***

3. Claims 10 and 12 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claims 10 and 12 do not further limit claim 9 because claim 9 requires that the lead-free solder for the solar cell is identical in composition as the lead-free solder for the interconnector. Thus, if Bi is present in the lead-free solder for the solar cell, then it must also be present in the lead-free solder for the interconnector. The "at least one" language in claim 10 at

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line 1 should be changed to "both" since the lead-free solder compositions are identical.

The same applies to claim 12 that depends from claim 10.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 2, 3, and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 2, at line 2, it is not clear what is meant by the term "matal paste fired". It is suggested that said term be changed to "fired metal paste". The same applies to dependent claim 5.

In claim 3, at line 2, it is not clear what is meant by the term "spattering". It is suggested that said term be changed to "sputtering".

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-3, 6, and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by Johnston, Jr, U.S. Patent 3,982,265

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Johnston, Jr teaches a solar cell (1) that has electrical contacts (6) and (7) that are deposited by electroplating and then coated with indium solder (i.e., 100% indium) so as to connect the contacts (6, 7) to gold wire leads (see col. 4, lines 61-68; and Figure 1). Johnston, Jr's connection reads on the instant interconnector since the contacts (6,7) are metal and correspond to the instant metal core. It is the Examiner's position that Johnston, Jr's solar cell is the same as the cleaned solar cell in instant claim 6. Furthermore, it is the Examiner's position that said electroplated contacts (6, 7) are the same as those prepared from fired metal paste in instant claim 2. Since Johnston, Jr teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

8. Claims 1-3 and 6-10 are rejected under 35 U.S.C. 102(b) as being anticipated by Itagaki, U.S. Patent 5,328,520.

Itagaki teaches Cu wire interconnectors (26) for connecting a string of solar cells, wherein the Cu wire (26) is connected to the electrode (20b) of a solar cell using, for example, Bi-Sn alloy solder (see col. 5, lines 56-64; and Figures 5 and 6). Thus, both the Cu wire (26) and the electrode (20b) are coated with the solder. The electrode (20b) is formed from indium alloy and reads on the electrode in instant claims 2 and 3. It is the Examiner's position that Itagaki's solar cell is the same as the cleaned solar cell in instant claim 6. Since Itagaki teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

9. Claims 1-4, 6-9, and 13-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Borenstein et al, U.S. Patent 5,178,685.

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Borenstein et al teaches solar cells having fired silver ink bus bars (24, 26) and fired silver solder pads (20), and copper interconnectors (52, 54) which interconnect the solar cells, wherein said interconnectors (52, 54) are soldered to the bus bars using a Sn-Ag alloy solder containing 96% tin/4% silver (see Example 1 at cols. 10 and 11; and Figures 7 and 8). It is the Examiner's position that Borenstein et al's solar cells are the same as the cleaned solar cell in instant claim 6. Furthermore, it is the Examiner's position that Borenstein et al's fired silver ink bus bars are the same as those in instant claim 3. Since Johnston, Jr teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

10. Claims 1, 4, 6-9, and 13-15 are rejected under 35 U.S.C. 102(a) as being anticipated by Rosenblum et al, "ISO 14000 Introduction in the Photovoltaic Industry," Conference Record of the 28<sup>th</sup> Photovoltaic Specialists Conference, September 15-22, 2000, pages 1476-1478.

Rosenblum et al teaches solar cells connected using tabbing that has been coated with 96% Sn/4% Ag solder (see page 1477). The tabbing (i.e., metal tabbing) coated with solder reads on the instant metal core coated with lead-free solder. The solar cells have, for example, silver contacts (see page 1477). Since Rosenblum teaches the limitations of the instant claims, the reference is deemed to be anticipatory.

### ***Claim Rejections - 35 USC § 103***

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 1-4 and 6-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Itagaki, U.S. Patent 5,328,520, in view of Chen et al, U.S. Patent 5,569,433.

Itagaki teaches Cu wire interconnectors (26) for connecting a string of solar cells, wherein the Cu wire (26) is connected to the electrode (20b) of a solar cell using, for example, Bi-Sn alloy solder (see col. 5, lines 56-64; and Figures 5 and 6). Thus, both the Cu wire (26) and the electrode (20b) are coated with the solder. The electrode (20b) is formed from indium alloy and reads on the electrode in instant claims 2 and 3. It is the Examiner's position that Itagaki's solar cell is the same as the cleaned solar cell in instant claim 6. The Bi-Sn alloy solder is an example of the solder that can be used, but Itagaki is not limited to this solder (see col. 5, lines 56-64). Other solders that have a melting point lower than the electrode (20b) can be used (see col. 5, lines 56-64). Itagaki teaches the limitations of the instant claims other than the difference which is discussed below.

Itagaki does not specifically teach the amount of Bi in said Bi-Sn alloy solder, nor does Itagaki specifically teach the use of a Sn-Bi-Ag-based solder. Chen et al is relied upon for teaching that the Bi-Sn alloy solder that is conventional is the binary eutectic 58% Bi-42% Sn alloy (see col. 1, lines 26-31). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used 58% Bi-42% Sn alloy solder for Itagaki's Bi-Sn alloy solder because said 58% Bi-42% Sn alloy solder is conventional, as shown by Chen et al.

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Alternatively, Chen et al teaches that the addition of small amounts of Ag below 1% by weight is effective in making Bi-Sn alloys less strain-rate sensitive without deleteriously affecting the melting character of the alloy (see col. 1, lines 40-52). A preferred alloy comprises 54.75% bi, 45% Sn, and 0.25% Ag (see col. 1, line 52). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used Chen et al's alloy Bi-Sn-Ag-based solder, such as the one comprised of 54.75% bi, 45% Sn, and 0.25% Ag in place of Itagaki's Bi-Sn solder because the addition of small amounts of Ag below 1% by weight is effective in making Bi-Sn alloys less strain-rate sensitive without deleteriously affecting the melting character of the alloy, as taught by Chen et al.

13. Claims 1-4, 6-9, and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rosenblum et al, "ISO 14000 Introduction in the Photovoltaic Industry," Conference Record of the 28<sup>th</sup> Photovoltaic Specialists Conference, September 15-22, 2000, pages 1476-1478, in view of Hu et al, Solar Cells from Basic to Advanced Systems, McGraw-Hill Book Company (1983), pages 81-85.

Rosenblum et al teaches solar cells connected using tabbing that has been coated with 96% Sn/4% Ag solder (see page 1477). The tabbing (i.e., metal tabbing) coated with solder reads on the instant metal core coated with lead-free solder. The solar cells have, for example, silver contacts (electrodes) (see page 1477). Rosenblum teaches the limitations of the instant claims other than the difference which is discussed below.



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Rosenblum et al does not specifically teach how its silver electrodes are formed. Hu et al is relied upon for teaching that silver can be used for the electrodes of a solar cell, and that the electrodes can be formed by evaporation of the metal with subsequent deposition (i.e., metal vapor deposition), firing a metal paste, etc (see in particular, page 81). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have used, for example, metal vapor deposition or firing a metal paste so as to form the electrodes for Rosenblum et al's solar cells because these are conventional methods for forming the electrodes of a solar cell, as taught by Hu et al.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alan Diamond whose telephone number is 703-308-0840. The examiner can normally be reached on Monday through Friday, 5:30 a.m. to 2:00 p.m. ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on 703-308-3322. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



Alan Diamond  
Primary Examiner  
Art Unit 1753

Alan Diamond  
September 2, 2003